Small Business Innovation Research/Small Business Tech Transfer

Algorithm Development for a Coherent Fiber Lidar as a Wake Vortex Monitoring Sensor, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

The capacity of coherent Lidar systems to produce a continuous, real-time, 3D scan of wind velocities via detection of backscatter of atmospheric aerosols in clear-air conditions gives this technology a clear advantage over other technologies. LIDAR has proven its value in a number of applications, including the detection of clear-air turbulence, wind shear, and aircraft wake vortices. Of interest under this NASA sub-topic is the development of Lidar systems capable of detecting and measuring aircraft wake vortices in order to enhance aircraft separation criteria. To perform this task well a Lidar must have certain characteristics and be paired with a highly optimized wake processing algorithm. Key areas of development include: - Pulse energy / pulse repetition frequency (PRF) combination to adequately sample a region of space containing the wake vortices. - Pulse width for optimally sampling the wake disturbance. Determination of the optimal range resolution for measuring wakes is algorithm dependent and is an area of current research. - Scanner capable of efficiently scanning the region of interest. The scanner needs to be able to report the elevation and azimuth accurately so that wake positions can be estimated. - Raw data acquisition and signal processing for generating range resolved Doppler spectral estimates. Processing should produce periodograms over the 2D or 3D region of interest with adequate frequency resolution, velocity bandwidth and with minimal distortion. - Wake vortex algorithm for detecting, tracking and estimating the circulation strength and position of the vortices from the Doppler spectral estimates. SIBELLOPTICS proposes a Phase 1 SBIR to determine the feasibility of its compact, innovative fiber LIDAR sensor, now in Phase II development, to detect and measure wake vortices using spatially dependent spectral matched filter algorithms similar to those currently being developed for NASA by Coherent Research Group.

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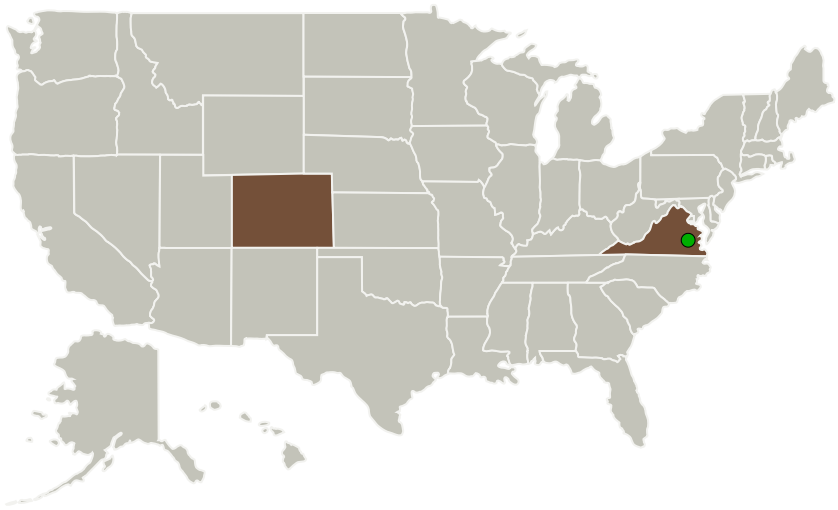
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
SibellOptics	Lead Organization	Industry	Lafayette, Colorado
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137988)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

SibellOptics

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

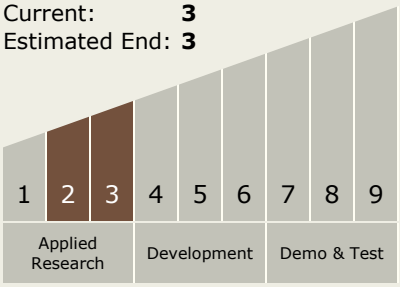
Carlos Torrez

Principal Investigator:

Richard L Higgins

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Images

Project Image
Algorithm Development for a Coherent Fiber Lidar as a Wake Vortex Monitoring Sensor *(https://techport.nasa.gov/image/130316)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System